SGML Documents:
Where Does Quality Go?

José Carlos Ramalho
Jorge Gustavo Rocha
José João Almeida
Pedro Rangel Henriques

Language Processing and Specification Group
Computer Science Department
University of Minho
Portugal

What will we discuss?

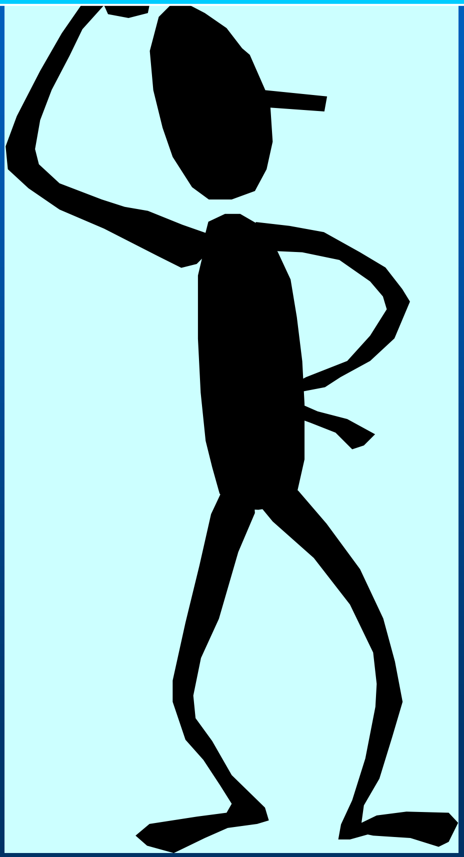
- When information increases, when information sources increase and vary, what happens to quality?
- How can we ensure/preserve quality?
- What is quality (what are we talking about)?
- In what contexts is quality more relevant?
- Can we measure it? ...

What are we doing with SGML?

- Constructing document DBs
- Publishing books on the Internet
- Converting parish registers (XIII and XIV century) to SGML
- Publishing from SGML DBs: Internet, CDROM, paper, …
- Connecting SGML Documents to GIS

Quality?

Lots of Subjectivity



- Quality is good.
- Quality is important.
- Quality is when something is good and achieves to remain good for a period of time.
- Attribute, class, category (from dic.).
- Specific attribute that distinguishes a person, a thing or an entity (from encycolpedia).

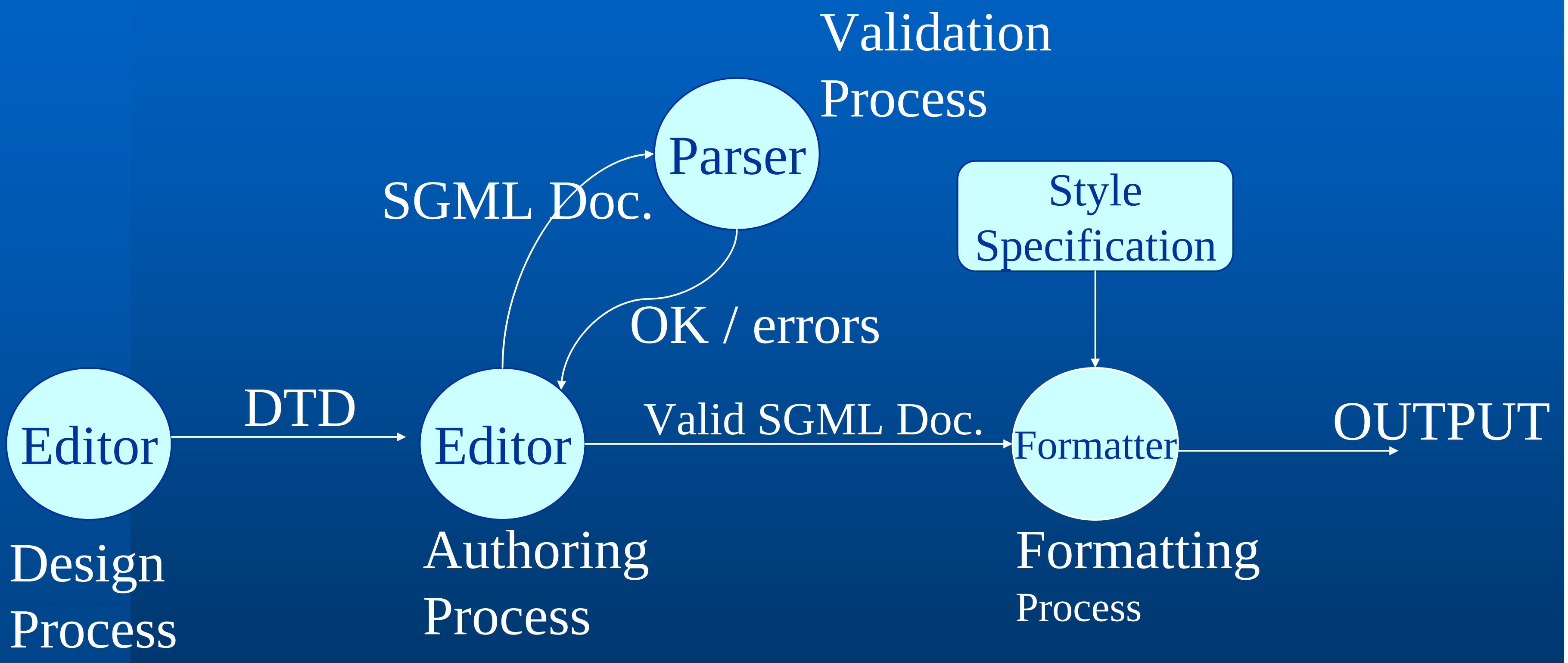
Quality (in our context)?

- → Interface
- → …
- → Data relevance
- → …
- → Data correctness ⇐ There is a lot less subjectivity in this item

Aims of this work

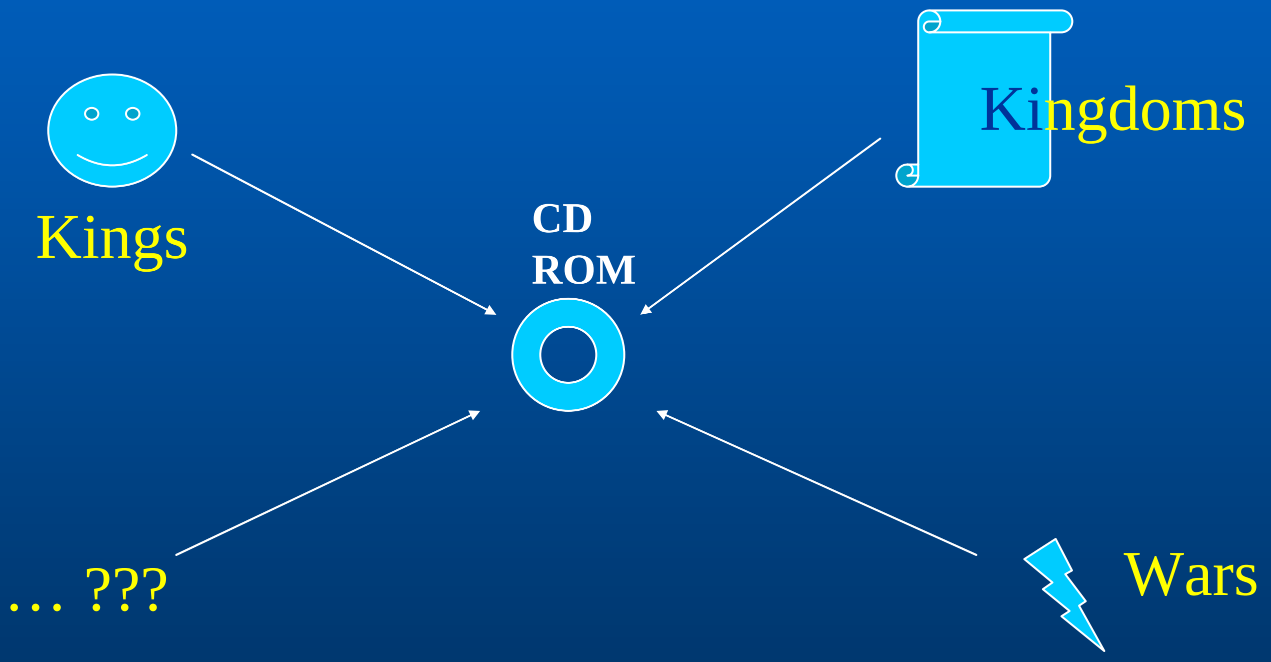
- We want to minimize *Data Incorrectness*
- We don’t want to change existing models
- We want to extend them
- In the end we want to eliminate information revision cycles

SGML authoring and processing model



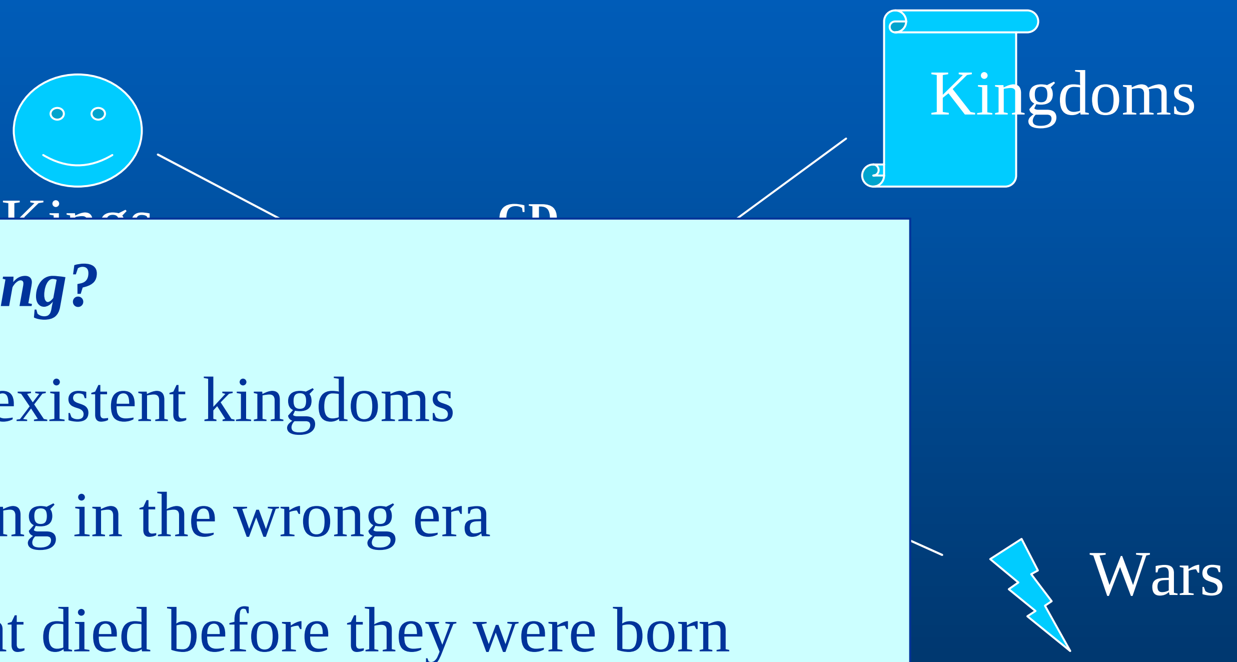
Data (in)correctness

Example 1: Portuguese History



Data (in)correctness

Example 1: Portuguese History

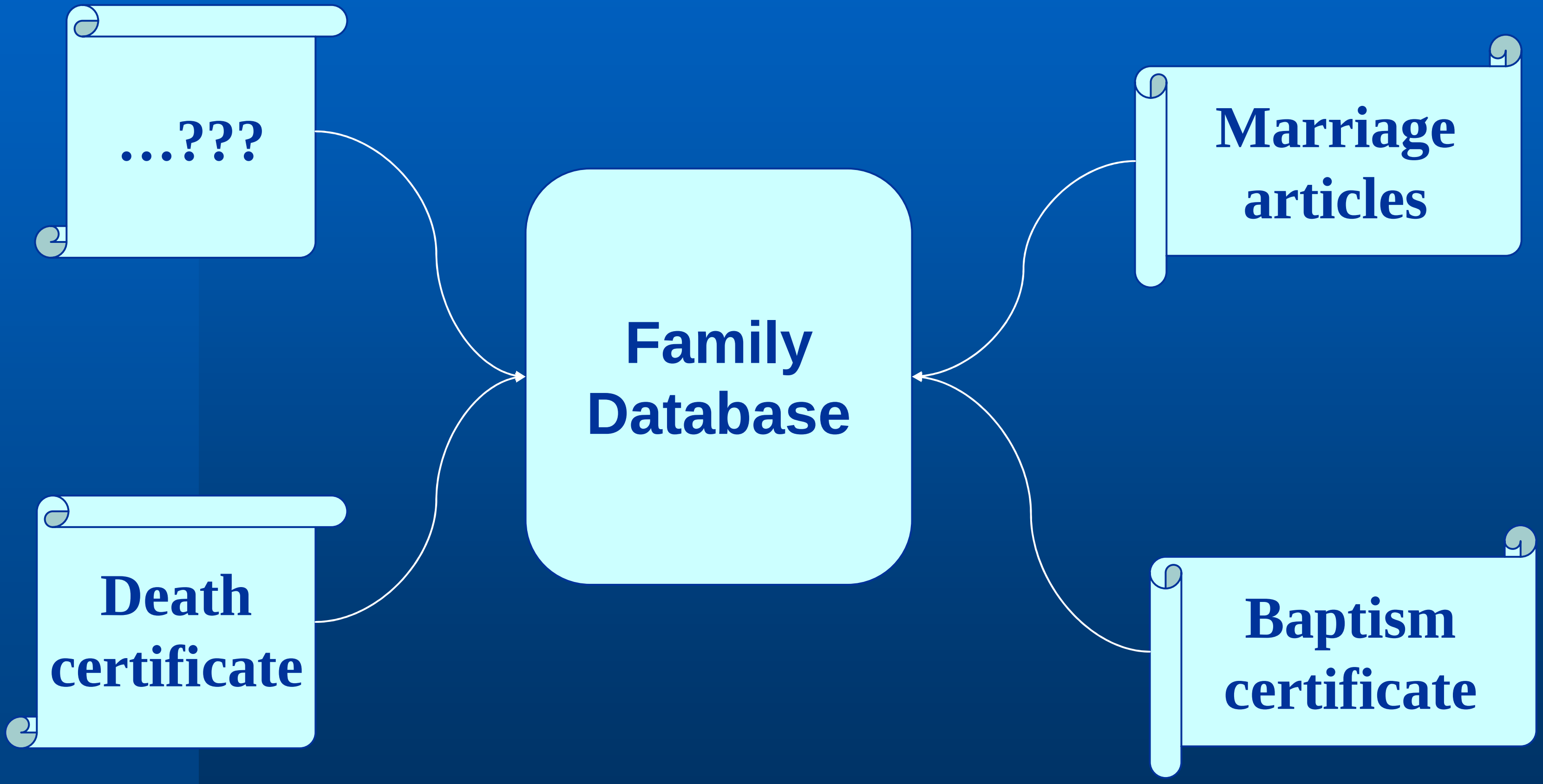


What went wrong?

- Kings with inexistent kingdoms
- Wars happening in the wrong era
- Characters that died before they were born
- ...

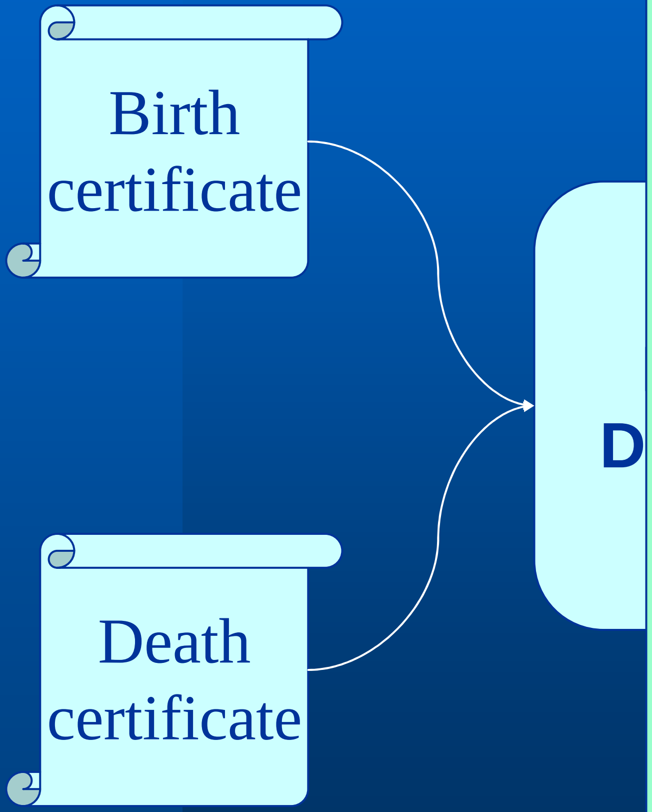
Data (in)correctness

Example 2: Parish register (XIII and XIV century)



Data (in)correctness

Example 2: Parish register (XIII and XIV century)



Problems:

- negative ages
- death before baptism
- marriages between people with age differences higher than 100
- ...

What do we propose?

- An extra validation task:
  - we need an additional level of abstraction separating information content from document structure.
- Implemented over an external functional system (in the moment …)
- Capable of expressing invariants and pre-conditions over data contents
- Invisible from the user point of view

How?

- **Special *Comment Sections*: embedding code in DTDs**

```
<!DOCTYPE  king  [
<!ELEMENT  king  -- (name,coname, bdate,…)>
<!-- INV
   inv_king(k) = …
-->
```

- **Throught an anchor to an external file**

```
<!-- INV: king.cam -->
<!DOCTYPE  king [ … ]>
```

Example: kings and decrees

```
<!-- INV: king.cam   -->
<!DOCTYPE  king  [
<!ELEMENT  king -- (name, coname,
     bdate, ddate,decree+)>
<!ELEMENT  decree -- (date, body)>
<!ELEMENT
     (name,coname,bdate,ddate,date) --
     (#PCDATA)>
<!ELEMENT  body -- (#PCDATA)>
]>
```

king.dtd

```
Inv_king(k) =
    { if( k notin famous_personsDB →
              k ++ “ not in FPDB”),
      if( bdate_(k) > ddate_(k) → k ++
              “died before he has born”),
      if( ddate_(k) - bdate_(k) > 120  →
              k ++ “lived more than 120”),
      if( !all( x ← decree_l(k) :
               bdate_(k) < date_(x)  /\
               date_(x) < ddate_(k) ) →
               k ++ “made a decree outside
                     his life” )
    };
```

king.cam

Example: kings and decrees

```
<king>
   <name>D.Dinis</name>
   <coname>Farmer</coname>
   <bdate>1270.09.23</bdate>
   <ddate>1370.09.23</ddate>
   <decree>
      <date>1300.07.15</date>
      <body>From this day only bicycles are allowed to circulate.</body>
   </decree>
   <decree>
      <date>1389.11.03</date>
      <body>McDonald’s will sell green wine instead of COCA-COLA.</decree>
</king>
```

ERRORS:

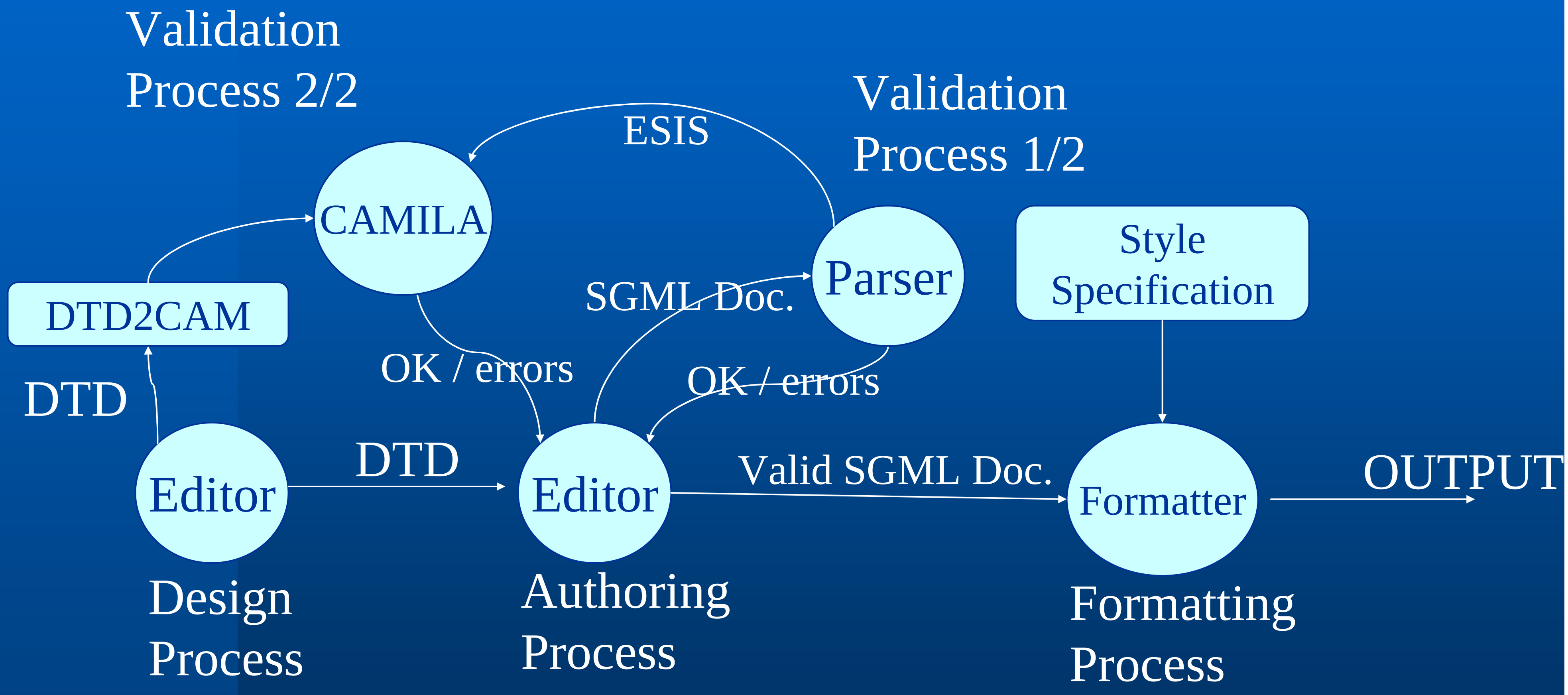
D.Dinis must be inserted in FPDB.

D.Dinis made a decree outside his life.

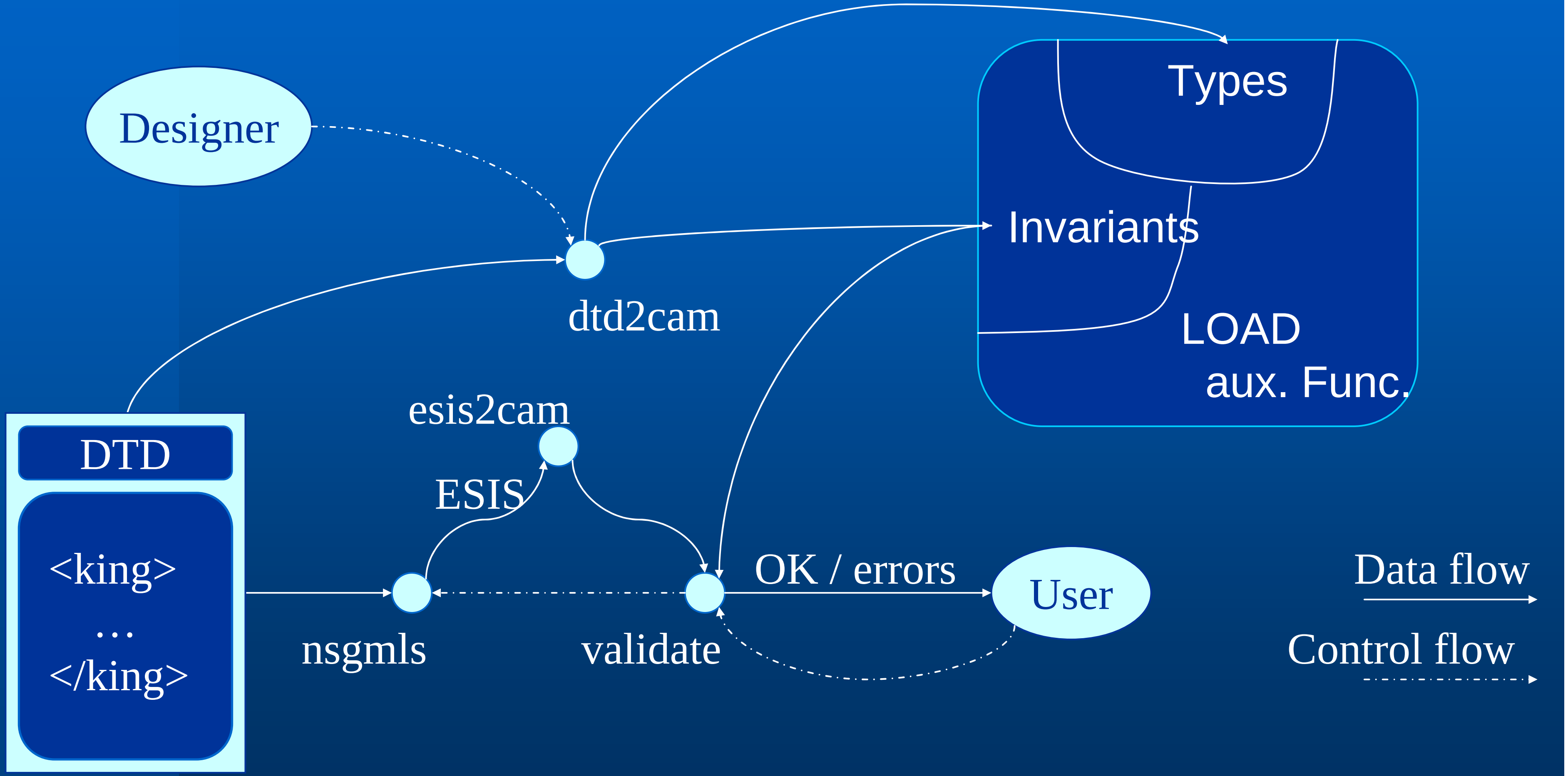
Other Examples

- Tying an Archaeological Database to a GIS:
  - archaeological SGML documents have geographical coordinates.
  - we must ensure that every one of those coordinates is within a certain range.
- City Council Elections
  - each voting section produces a final report with the results (an SGML document).
  - we must ensure that the number of votes matches the number of subscribed voters minus the absent ones.

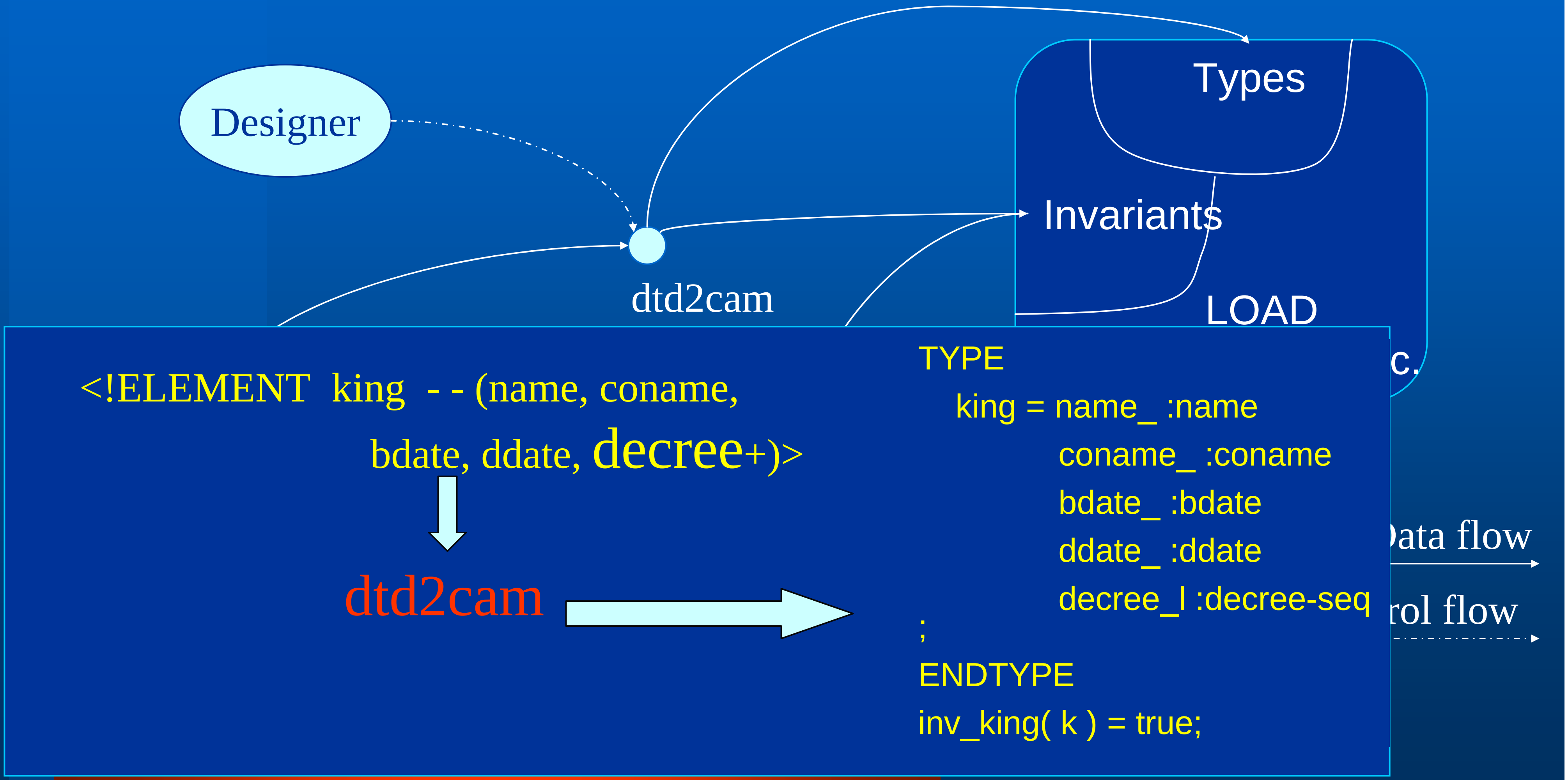
New SGML auth. and proc. model



Camila Validation Process



Camila Validation Process



```
<!ELEMENT  king  - - (name, coname,
                 bdate, ddate, decree+)>
```

dtd2cam

```
TYPE
   king = name_ :name
          coname_ :coname
          bdate_ :bdate
          ddate_ :ddate
          decree_l :decree-seq
;
ENDTYPE
inv_king( k ) = true;
```

Conclusion

- The new proposed model enables us to put some kind of data constraints associated with DTD element contents.
- We can avoid many errors given by a distracted user.
- We can improve information quality and reduce information revision cycle.

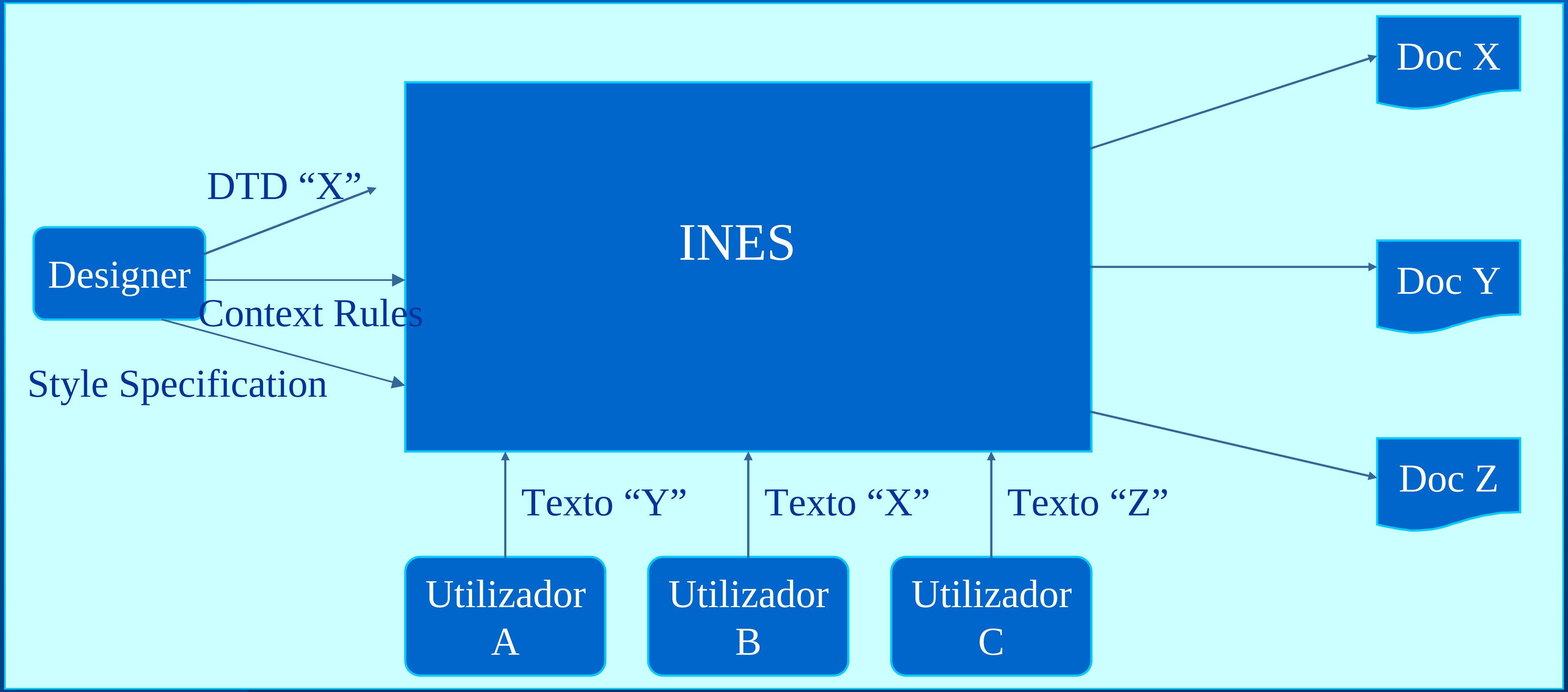
Conclusion (cont.)

- **In the case studies we have dealed with so far we didn’t find complex invariants.**
- **Structural correctness imposed by SGML already enforces some validation over element contents.**
- **Most of needed invariants are very simple: domain range validation, relationship validation, ...**

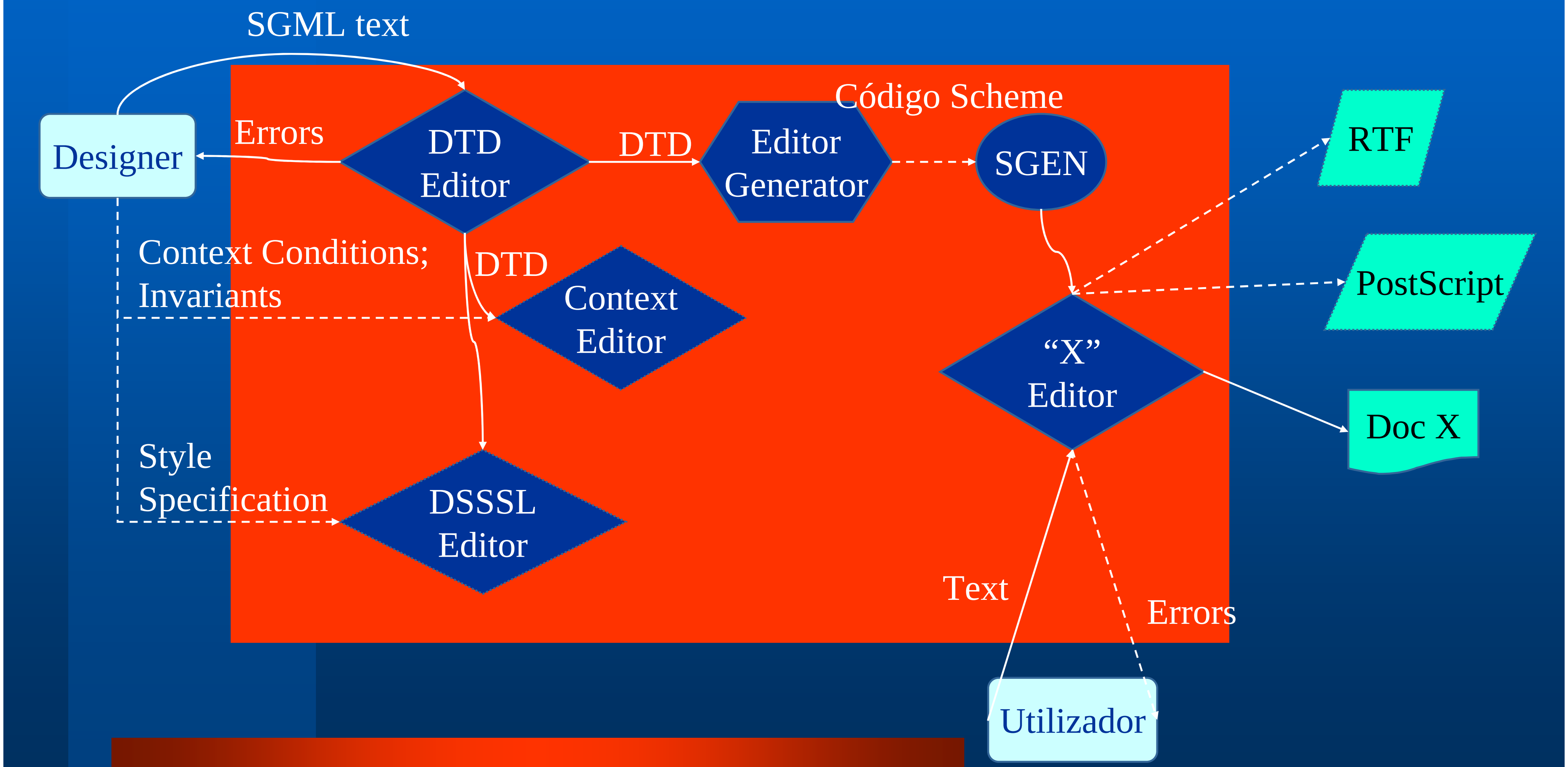
Future Work

- A simple constraint language is being studied/created to optimize the proposed system.
- We are going to implement this validation scheme (with the new language) in our prototype INES (“A Document Programming Environment”).

INES: Document Programming Env



INES: inside


SGML text
Designer
Errors
DTD Editor
DTD
Editor Generator
Código Scheme
SGEN
RTF
PostScript
Context Conditions; Invariants
DTD
Context Editor
"X" Editor
Doc X
Style Specification
DSSSL Editor
Text
Errors
Utilizador